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ABSTRACT

This report presents the results of the School Utilization Study (SUS) sponsored by the Center for Statistics and the Corporation for Public Broadcasting in 1982-83, which surveyed a sample of 2,700 teachers from schools across the nation to obtain information both on ways in which computers are being used by teachers in public and private schools, and on teachers' attitudes and opinions about the effectiveness of computers. To compare and contrast these findings, relevant information from outside studies is also summarized. The details of the findings are organized under: (1) "How Computers Are Being Used by Teachers," which summarizes most frequent usage by subject areas and grade levels; (2) "Teachers' Attitudes and Opinions about Computers," which cites teachers' desire for more training in computers, the need for more and better computer software, and problems with hardware and integrating the computers into subject areas; (3) "The Need for High Quality Software and Teacher Training," which indicates a need for more software in the areas of enrichment in specific subject areas, in computer literacy, and for challenging high achievers; and (4) "Methodology," which includes an overview of the study design and a discussion of the reliability of estimates of findings. Results of data analyses are highlighted in three tables. (DJR)

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Contact: Janice Ancarrow
(202) 357-6397

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Teachers' Views on Computer Use in Elementary and Secondary Schools

Many educators believe that computers offer tremendous potential for improving education and may revolutionize the education process.[1] As Sanders (1981) indicated, "Computers can bring to the educational process such attributes as untiring patience, around-the-clock availability, and individualized and student-paced instruction programs, . . . " (pp. 480-481).[2] Over the years, schools across the country have demonstrated very strong interest in computers as measured by their acquisition of microcomputers. In a 1982 bulletin, the Center for Statistics (formerly the National Center for Education Statistics) reported that the number of microcomputers acquired by schools increased from about 31,000 units in fall 1980 to about 96,000 units in spring 1982.[3] As of June 1983, computers (terminals *and* microcomputers) were available in about 60 percent of elementary schools, 90 percent of middle/junior high schools, and virtually all senior high schools (99 percent) in this country. In the fall of 1984, microcomputers in schools numbered 570,000 units. By September 1985, the number of microcomputers in public schools was approximately 850,000 units, available in 91 percent of elementary schools, 97.3 percent of middle/junior high schools, and 97.4 percent of senior high schools.[4] When both terminals *and* microcomputers are considered, the total number of computers used for instruction in public and private schools in the spring of 1985 was 1,030,000 units.[5]

Undoubtedly, computers have an important role to play in the schools. However, the importance of this role, to a large extent, depends on how teachers use computers and how teachers view the effectiveness of computers. Up to now, little information has been available on this subject. Thus, the primary purpose of this report is to provide historical information about the ways in which computers are being used by teachers in public and private schools, and about teachers' attitudes and opinions about the effectiveness of computers.

The number of computers in schools has changed dramatically, quadrupling between 1983 and 1985;[6] yet the three major types of teachers' instructional use examined by Becker still exhibit the same order in 1985 that occurred in 1983 in the School Utilization Study (SUS). Enrichment is still the greatest use in 1985, with regular instruction (computer literacy) next; and remediation (drill and practice), last.[7] Therefore, it seems reasonable to expect that the information in this report on teachers' views of computer use in 1983 is still current. These SUS teacher attitude and opinion data are the most generalizable national data available. They represent a national probability sample of all elementary and secondary teachers, representing both computer users and nonusers.

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[1]The National Science Board Commission on Precollege Education in Mathematics, Science and Technology, "Educating Americans for the 21st Century," 1983, pp. 31-67.

[2]Sanders, D.H. Computers in Society (3rd ed.) New York: McGraw-Hill, 1981, pp. 480-481.

[3]Wright, D. Instructional Use of Computers in Public Schools. An NCES bulletin, 1982. (NCES 82-245).

[4]Hood, J. Personal Communication. Market Data Retrieval, Inc., "Microcomputers in Schools, 1984-85."

[5]Becker, H. J. Unpublished data from the Second National Survey of Institutional Uses of School Computers, June 1985, Johns-Hopkins University. Survey funded by the National Institute of Education and NCES.

[6]Becker, H. J. "Instructional Uses of School Computers," No. 1, June 1986, Johns-Hopkins University, Reports from the 1985 national survey.

[7]Becker, H.J. "Instructional Uses of School Computers," No. 2, August 1986, Johns-Hopkins University. Reports from the 1985 national survey.

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To be certain whether or not any change has occurred in teachers' overall views of computers in the schools, a follow-up SUS survey is needed. Such a study would include, at a minimum, the same attitude and opinion items that were asked in SUS 83. Although some additional teacher attitudinal and teaching practice data on nonusers will be presented in a forthcoming newsletter by Becker (see note 5), his upcoming data are only representative of nonusers at the same schools where users were sampled. Also, questionnaire items on teacher attitudes in Becker's 1985 study measure somewhat different aspects of computer effectiveness than the SUS study examined. Nevertheless, Becker's new data will provide insight into effective teaching practices in specific subject areas, comparing users with nonusers.

This report is primarily based on the results of the School Utilization Study (SUS), 1982-83, jointly sponsored by the Center for Statistics (CS) and the Corporation for Public Broadcasting.[9] The study involved a sample of 2,700 teachers in 1,350 schools across the Nation. Data were collected during the late winter and spring of 1983. More information about the study is presented in the methodology section at the end of this report. To compare or contrast these findings, relevant information from outside studies is also summarized in this report. Thus, a historical context is provided in which these data may serve as a base line.

Overall, computers in schools were being used more frequently for enrichment and teaching computer literacy than for other instructional purposes. A majority of teachers agreed that computers can help teachers to teach more effectively; however, they felt that teachers should preview software before it is purchased by the school. Predictably, teachers were crying out *en masse* for more training in computers. Details of these findings are presented below.

How Computers are Being Used By Teachers

The most frequent use of computers by teachers (combining and averaging across school levels) was for enrichment in special subject areas (59 percent of computer-using teachers reported such use), followed by challenging high achievers (47 percent), and teaching computer literacy (46 percent) (table 1). By school level, enrichment was the most frequent use for elementary (65 percent) and middle/junior high schools (57 percent); however, at the high school level, the most frequent use was for teaching computer literacy (45 percent). Table 1 is based on teachers reporting *any instructional* use of computers with their classes. Of the 44 percent of the Nation's teachers who reported computers available for use with their classes, 62 percent of these teachers reported using them for instruction. A related CS report, also based on this study, examined how the instructional use of computers varies by school and district factors.[9]

In general these findings of computer use at the secondary level were supported by the findings of Becker's 1983 national study,[10] although some of Becker's categories were different. He included categories of administrative use and excluded enrichment. Becker found that, in secondary schools, teachers reporting *regular or extensive uses* of microcomputers at their schools showed an overwhelming emphasis on computer literacy (85 percent) and programming (76 percent), with drill and practice third (31 percent).

One might ask, "For what subject is a teacher most likely to use a computer?" When Becker investigated the question of major responsibility by grade level in his 1985 study, he found the following: At grades K-5, 70 percent of the computer-using teachers taught general or mixed subjects and 11 percent special education; at grades 6-8, 29 percent general, 23 percent mathematics, 12 percent English or reading, and 11 percent computer subjects; and at grades 9-12, 22 percent mathematics, 19 percent computer subjects, 20 percent business, and 10 percent science. Small percentages of computer-using teachers, from 1 to 9 percent, represented a variety of primary teaching responsibilities. Although these computer-using teachers probably also used the computer in their primary teaching areas, it is uncertain because of the way the question was asked. The teachers were not asked specifically whether or not they used the computer in these particular subjects.

Teachers' Attitudes and Opinions about Computers

The vast majority (90 percent either agreed or strongly agreed) of surveyed teachers stated that they wanted more training in computers (7 percent had no opinion) and that they wanted to preview computer software before purchase (9 percent had no opinion) (table 2). Most teachers believed, according to these data, that computers can help teachers to teach more effectively (82 percent). The results also indicate that teachers did not find computers to be disruptive to classroom activity (63 percent).

About one-third (31 percent) of the teachers indicated that they did not feel comfortable working with computers; while 18 percent expressed no opinion, apparently about half of the teachers (51 percent) were comfortable using computers. Approximately one-third of the teachers felt that integrating the computer into other subject areas was simple; another one-third

[9]Riccobono, J. A. "Availability, Use, and Support of Instructional Media, 1982-83." The Corporation for Public Broadcasting, Washington, D.C., 1985.

[9]Ancarrow, J. S. "Differences in Teachers' Instructional Use of Computers, by School and District Factors," June 1986, CS 86-220b.

[10]Becker, H. J. "School Uses of Microcomputers," No. 1, April 1983, Johns-Hopkins University. Reports from a National Survey, funded by National Institute of Education. In 1985, a follow-up study was conducted.

Table 1.—Percent of teachers reporting instructional purposes for computer use by school level: School year 1982-83

Instructional computer use	Total teachers 1 (580,000)	School level		
		Elementary teachers (354,000)	Middle/junior high school teachers (119,000)	Senior high school teachers (107,000)
		(In percent)		
Enrichment in specific subject areas	59	65	57	40
Challenging high achievers	47	55	45	23
Computer literacy (e.g., intro to computer concepts)	46	43	54	45
Remedial instruction for regular classroom students	43	46	47	26
Regular instruction in specific subject areas for all students	43	45	46	34
Computer programming	25	17	36	39
Computer applications (e.g., word processing or advanced problem solving)	19	15	20	34
Instruction for special education students	13	13	20	5
Bilingual instruction	1	<1	2	2
Other	7	5	7	16

[1]Analysis restricted to teachers who used computers in 1982-83.

disagreed; the remaining one-third abstained from declaring it one way or the other.

It is interesting to note that many teachers were undecided or ambivalent about both the instructional quality of available software (35 percent positive, 17 percent negative, and 49 percent no opinion), and the difficulty in using the hardware (8 percent indicated difficulty, 51 percent no difficulty, and 41 percent no opinion). In addition, these data illustrate a potential problem for teachers: Although 90 percent of the teachers indicated that they wanted to preview software, nearly half of all of the teachers surveyed had no opinion about the quality of the software that is currently available to them. Assuming that the software is made available to teachers for review, it appears that this gap between what some teachers say they want on the one hand, and what some teachers presently do, on the other hand, could be filled by some preservice or inservice teacher training in how to evaluate instructional software. Dennis's (1979) comprehensive list of competencies necessary for instructional use of computers by classroom teachers included the ability to evaluate the effectiveness of instructional computer programs.[11]

Teachers have previously expressed the desire for training in the use of computers. In the spring of 1982, a sample of 1,700 teachers in the National Education Association (NEA) was surveyed about computers (response rate of 71 percent). Those teachers also expressed an interest in taking an instructional computer

[11]Dennis, J. R. "Teacher Education in Use of Computers." Paper presented to the Illinois Series on Education Application of Computers, No. 1e, University of Illinois, Urbana, Illinois, 1979. (ERIC Document Reproduction Service No. D 183 181).

Table 2.–Percent of teachers reporting attitudes and opinions about computers: School year 1982-83 [1]

Questionnaire Items	Strongly agree	Agree	Disagree	Strongly disagree	No opinion
			(In percent)		
Computers can help teachers teach more effectively.	28	54	4	<1	13
Having one or two students work at a computer is seriously disruptive to the rest of my classroom activity.	2	11	40	23	24
I want more training in computers..	46	44	3	1	7
The software available to me is quite good instructionally.	5	30	10	7	49
I do not feel comfortable about working with computers.	8	23	31	20	18
Previewing software should be done by teachers before purchase.	46	44	1	<1	9
Integrating computer time with other subject areas is a fairly simple matter.	4	28	25	8	34
The hardware, or equipment, is difficult to use.	1	7	37	14	41

[1]Analysis based on all teachers.

course (82.6 percent). They, too, reported considerable dissatisfaction with both the amount of software available (53.4 percent), and the quality of software available (46.3 percent). These teachers viewed the primary purpose of instructional computing to be fostering an awareness of computers (56 percent), while basic computer skills (52 percent), programming skills (34.7 percent), and skills in another subject such as mathematics and reading (50.7 percent) were less often cited as the primary purpose. NEA's results showed the greatest need of computer-using teachers to be more software (42.2 percent), followed by the need for personal knowledge about computing (28.1 percent), and more computers (21.9 percent). Only 11.2 percent of respondents to that survey were computer-using teachers, and only 6.2 percent were using the computer for instruction during spring of 1982.[12]

The Need for High Quality Software and Teacher Training

Although teachers' most frequent uses of the computer include enrichment and computer literacy, the bulk of the available software is for drill-and-practice instruction. (It is cheaper to produce, easier to produce, can be used over and over and for more than one grade level, and is simple to run.) Becker's 1985 data show that the greatest amount of software available in schools at every level is for computer-assisted instruction; that is, drills, tutorials, simulations. These data may indicate that producers of software, in order to respond to teachers' instructional needs, should produce more high quality software of the type that can be used for enrichment in specific subject areas, computer literacy, and challenging high achievers. The software the teachers need for their greatest area(s) of use (enrichment, challenge, literacy) is not as widely available to teachers as is a lesser used area of software (drill and practice). This situation points to an area of need that might be remedied by supplementary efforts between publishers of software and providers of teacher training. Such a partnership (publishers of computer software and teacher-training providers) is currently being developed to some extent.

Teacher-training programs in education departments in this country are focusing their greatest use of microcomputers on teaching computer literacy, which colleges of education are beginning to recognize as an important aspect of training school teachers.[13] In a 1982

[12]A Teacher Survey NEA Report: Computers in the Classroom. National Education Association, Reston, VA, 1983.

[13]The Chronicle of Higher Education, March 30, 1983; Volume XXVI, number 3. TALMIS, a consulting service for publishers of computer software in Oak Park, Illinois, surveyed 607 college and university faculty members who use microcomputers.

[14]Daniels, Ollie, "Computer Education in NCATE Colleges." A dissertion in the School of Education, University of Florida, 1982.

study of computer use in 182 teacher education programs, 37 (14 private and 23 public) or 26 percent of the respondents had computer awareness programs; in addition, a total of 60 percent (49 plus the 37 above) either had or planned to implement such programs within two to three years.[14] Among the specific skills reported by 31 of the 37 institutions with computer awareness programs, 24 of them (77 percent) included "reviewing programs." Perhaps all future preservice, as well as inservice, training programs in computer literacy could be expanded to include a training segment on the review and evaluation of instructional software, both to respond to the perceived need (by teachers in this survey) for such a training segment, and in order to increase the educational productivity of teachers.

Methodology

Overview of Study Design

The SUS 1982-83 sample design called for a sample of classroom teachers, schools, and school districts. The sampling procedure was designed to ensure to the extent possible that every teacher in the Nation (in public school districts and Catholic dioceses with enrollments of 300 or more) had an opportunity to be selected for participation in the study. (Investigation in Catholic dioceses was restricted, however, to elementary school teachers.) A stratified multistage probability sample was employed, which involved: first, selecting a sample of school districts with probability proportional to size (PPS), using number of teachers as the size measure; second, selecting a sample of schools (to desired levels of elementary, middle/junior high, and senior high) within the selected districts; and, third, selecting a sample of two teachers within each selected school.

The final SUS 1982-83 sample sizes are shown below:

Districts/dioceses		619
Schools		1,350
Elementary	675	
Middle/junior high	338	
Senior high	337	
Teachers		2,700
Elementary	1,350	
Middle/junior high	676	
Senior high	674	

The SUS 1982-83 survey was conducted by mail questionnaire, with telephone follow-up interviews of mail nonrespondents. Survey questionnaires were developed to gather information at three levels: a Superintendent Questionnaire for district-level data, a Principal Questionnaire for school-level data, and a Teacher Questionnaire for classroom-level data. Data were collected during the period February through May 1983. Final response rates for the three questionnaires were: 86 percent for superintendents, 84 percent for principals, and 80 percent for teachers (2,160 teachers).

A sampling weight was assigned to each member in the original sample to account for unequal selection probabilities; these weights were further adjusted for instrument nonresponse. These adjusted weights were then used for estimating results for the total populations of superintendents, principals, and teachers in the Nation.

Three categories of school level were defined: elementary schools (schools with a lowest grade of less than 6, including K-8 or K-12), senior high schools (schools with a lowest grade of greater than 8), and middle/junior high schools (all other schools). Special schools (e.g., special education only, vocational/technical, adult education, and alternative/continuation education only) were excluded from this study.

Reliability of Estimates

The findings presented in this report are estimates based on the particular sample used and consequently are subject to sampling variability. If the questionnaires had been sent to a different sample, the responses would not have been identical; some numbers might have been higher, while others might have been lower. The estimated standard error of a statistic (a measure of the variation due to sampling) can be used to examine the precision obtained in a particular sample. If all possible samples were surveyed under similar conditions, intervals of 1.645 standard errors below, to 1.645 standard errors above, a particular statistic would include the average result of these samples in approximately 90 percent of the cases. For every possible sample, about 90 percent of the intervals would include the average number from all possible samples. Specific statements of comparison in the text are significant at the 90 percent confidence level or better. Please refer to the following table of generalized standard errors. The standard error for SUS data in table 1 is based on a sample size of 800; e.g., for an estimate of 10 or 90 percent of an analysis group, the generalized standard error is 1.55 percent. Table 2 is based on a sample size exceeding 2000. For a conservative estimate of 10 or 90 percent, the generalized standard error is .981 percent. Using the table of generalized standard errors, the standard error for comparing across two school levels A and B in table 1 can be found by calculating $\sqrt{[\text{s.e. (A)}]^2 + [\text{s.e. (B)}]^2}$ where s.e. (A) and s.e. (B) are the standard errors of percentages A and B and are located in the generalized variance table. If zero does not fall in the interval $(A - B) \pm 1.645 \sqrt{[\text{s.e. (A)}]^2 + [\text{s.e. (B)}]^2}$, then the difference is statistically significant at the 90 percent condifence level. For comparisons down any two instructional uses of the computer in table 1, or two teachers' value statements in table 2, the formula above provides a conservative estimate.

For More Information

For further information about this analysis and the School Utilization Study, 1982-83, please contact Janice S. Ancarrow, Center for Statistics, 555 New Jersey Avenue, N.W., Washington, D.C. 20208-1302, telephone (202) 357-6397. For single copies of this report contact Information Services at the same address, or telephone 1-800-424-1616.

Generalized standard errors in percentage points, classroom-level questions [1]

(Teacher's responses in SUS)

Sample size	Percentage response interval									
	1 99	5 95	10 90	20 80	25 75	30 70	35 65	40 60	45 55	50 50
2000	.325	.713	.981	1.31	1.42	1.50	1.56	1.60	1.63	1.64
800	.515	1.13	1.55	2.07	2.24	2.37	2.47	2.53	2.57	2.59

[1]The design effects associated with this stratified multistage probability sample have been incorporated into the computations that produced this standard error table.